The maximum covering cycle problem

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The *maximum covering cycle problem* (MCCP) [1] deals with the problem of finding a simple cycle C in an undirected graph $G(V, E)$ such that the number of vertices that are in C or adjacent to a vertex in C is maximal. In this contribution, the problem is formulated as an Integer Linear Programming (ILP) model and it is shown that the problem is NP-Hard. Next, an iterative constraint generation procedure (detailed in [1]) using a relaxed ILP formulation for the MCCP is presented, that allows to find the optimal solution for a given graph in a finite number of iterations. This procedure is subsequently enhanced by means of a set of heuristics that diversify and intensify the added cycle constraints in order to reduce the number of iterations required to find the optimal solution. We present computational results on a diverse set of instances that highlight the effectiveness of the added heuristic methods, and conclude with further research directions.

References

[1] Grosso, A., Salassa, F. & Vancroonenburg, W., *Searching for a cycle with maximum coverage in undirected graphs*, Optimization Letters (2016) 10(7): 1493–1504., https://doi.org/10.1007/s11590-015-0952-x